FORM PTO-1390 (Modified) (REV 11-2000) U.S. DEPARTMENT OF COMMERCE PATENT AND TRADEMARK OFFICE

TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

ATTORNEY'S DOCKET NUMBER: **112740-542**

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR): **10/069279**

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	PRIORITY DATE CLAIMED
PCT/DE00/02871	**23 August 2000**	**27 August 1999**

TITLE OF INVENTION

SMALL SCALE COMMUNICATION AND/OR DATA PROCESSING APPARATUS

APPLICANT(S) FOR DO/EO/US

Peter Nevermann

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☐ This is an express request to begin national examination procedures (35 U.S.C. 371(f)). The submission must include itens (5), (6), (9) and (24) indicated below.
4. ☒ The US has been elected by the expiration of 19 months from the priority date (Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371 (c) (2))
   a. ☒ is attached hereto (required only if not communicated by the International Bureau).
   b. ☐ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
   a. ☒ is attached hereto.
   b. ☐ has been previously submitted under 35 U.S.C. 154(d)(4).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371 (c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☒ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☐ have not been made and will not be made.
8. ☒ An English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☒ An oath or declaration of the inventor(s) (35 U.S.C. 371 (c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371 (c)(5)).
11. ☒ A copy of the International Preliminary Examination Report (PCT/IPEA/409).
12. ☒ A copy of the International Search Report (PCT/ISA/210).

Items 13 to 20 below concern document(s) or information included:

13. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
14. ☒ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
15. ☒ A **FIRST** preliminary amendment.
16. ☐ A **SECOND** or **SUBSEQUENT** preliminary amendment.
17. ☒ A substitute specification.
18. ☐ A change of power of attorney and/or address letter.
19. ☐ A computer-readable form of the sequence listing in accordance with PCT Rule 13ter.2 and 35 U.S.C. 1.821 - 1.825.
20. ☐ A second copy of the published international application under 35 U.S.C. 154(d)(4).
21. ☐ A second copy of the English language translation of the international application under 35 U.S.C. 154(d)(4).
22. ☒ Certificate of Mailing by Express Mail
23. ☐ Other items or information:

U.S. APPLICATION NO. (IF KNOWN, SEE 37 CFR)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NUMBER
10/069279	PCT/DE00/02871	112740-542

24. The following fees are submitted:.

BASIC NATIONAL FEE (37 CFR 1.492 (a) (1) - (5)) :

		CALCULATIONS PTO USE ONLY
☐	Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37 CFR 1.445(a)(2)) paid to USPTO and International Search Report not prepared by the EPO or JPO $1040.00	
☒	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO $890.00	
☐	International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO $740.00	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO but all claims did not satisfy provisions of PCT Article 33(1)-(4) $710.00	
☐	International preliminary examination fee (37 CFR 1.482) paid to USPTO and all claims satisfied provisions of PCT Article 33(1)-(4) $100.00	

ENTER APPROPRIATE BASIC FEE AMOUNT =	**$890.00**	
Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (e)).	**$0.00**	

CLAIMS	NUMBER FILED	NUMBER EXTRA	RATE		
Total claims	19 - 20 =	0	x $18.00	**$0.00**	
Independent claims	1 - 3 =	0	x $84.00	**$0.00**	
Multiple Dependent Claims **(check if applicable)**.			☐	**$0.00**	
TOTAL OF ABOVE CALCULATIONS =				**$890.00**	
☐ Applicant claims small entity status. See 37 CFR 1.27). The fees indicated above are reduced by 1/2.				**$0.00**	
SUBTOTAL =				**$890.00**	
Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492 (f)). +				**$0.00**	
TOTAL NATIONAL FEE =				**$890.00**	
Fee for recording the enclosed assignment (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31) **(check if applicable).** ☐				**$0.00**	
TOTAL FEES ENCLOSED =				**$890.00**	
				Amount to be: refunded	$
				charged	$

a. ☒ A check in the amount of **$890.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. _____ in the amount of _____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **02-1818** A duplicate copy of this sheet is enclosed.

d. ☐ Fees are to be charged to a credit card. **WARNING:** Information on this form may become public. **Credit card information should not be included on this form.** Provide credit card information and authorization on PTO-2038.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

William E. Vaughan (Reg. No. 39,056)
Bell, Boyd & Lloyd LLC
P.O. Box 1135
Chicago, Illinois 60690
312-807-4292

SIGNATURE

William E. Vaughan
NAME

39,056
REGISTRATION NUMBER

February 25, 2002
DATE

BOX PCT

IN THE UNITED STATES ELECTED/DESIGNATED OFFICE
OF THE UNITED STATES PATENT AND TRADEMARK OFFICE
UNDER THE PATENT COOPERATION TREATY-CHAPTER II

PRELIMINARY AMENDMENT

APPLICANTS:	Peter Nevermann	DOCKET NO.:	112740-542
SERIAL NO:		GROUP ART UNIT:	
FILED:		EXAMINER:	
INTERNATIONAL APPLICATION NO::		PCT/DE00/02871	
INTERNATIONAL FILING DATE		23 August 2000	
INVENTION:	SMALL-SCALE COMMUNICATION AND/OR DATA PROCESSING APPARATUS		

Assistant Commissioner for Patents,
Washington, D.C. 20231

Sir:

Please amend the above-identified International Application before entry into the National stage before the U.S. Patent and Trademark Office under 35 U.S.C. §371 as follows:

In the Specification:

Please replace the Specification of the present application, including the Abstract, with the following Substitute Specification:

SPECIFICATION

TITLE OF THE INVENTION

SMALL-SCALE COMMUNICATION AND/OR DATA PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a small-scale communication and/or data processing apparatus with an indicating device integrated in the apparatus.

The term small-scale communication and/or data processing apparatus is understood below as mobile telephones, cordless telephones, PDAs, organizers, palmtops or the like whose size is such that they can be held in one hand when being operated. However, this also can encompass relatively small apparatuses which are not taken along as mobile apparatuses, but are permanently installed; for example, relatively small table telephones.

Such small-scale apparatuses frequently have an indicating device in the form of an integrated display on which the information to be indicated by the apparatus is represented. Moreover, this display usually serves to control the apparatus. There are two conflicting requirements for all these small-scale electronic apparatuses that communicate with a user via a display. On the one hand, the apparatus itself is to be as small as possible, while on the other hand the indicating element, that is to say the display, is to be as large as possible. However, there is a mandatory limit in the case of the displays previously used, in that the indicating surface cannot be larger than the surface of the apparatus.

In order to circumvent this problem, many apparatuses use interfaces with the aid of which the apparatus can be connected to a stationary indicating apparatus; for example, a display screen. This has the disadvantage, on the one hand, that the advantage of mobility is lost when such a display screen is used, while on the other hand the appropriate display screen is not available at every site. In the case of stationary small-scale apparatuses, an external display screen increases the overall space requirement of the apparatus, including the indicating system. Thus, instead of a small-scale apparatus, use could be made here of a larger apparatus with a correspondingly large display.

It is an object of the present invention, therefore, to create an alternative to this prior art.

SUMMARY OF THE INVENTION

This object is achieved by the present invention in that the indicating device integrated in the apparatus has an image projector.

In the case of such an active indicating system, integrated in the apparatus, in the form of an image projector, use simply is made of a flat reflecting region as indicating surface; for example, a piece of paper or a table. The advantage lies in the fact that such a passive indicating surface can be made available virtually anywhere. The indicating surface can be substantially larger in this case than the surface of the apparatus. That is, the apparatus can have an indicating surface the size of a laptop, for example, whereas the apparatus itself is substantially smaller than a laptop. No sort of stationary external indicator, such as an external display screen or similar, is used in this case. Thus, there also is no need to supply energy for a relatively large display screen. The indicating surface can be constructed again and again in simplified fashion and need not be carried around.

The image projector preferably has a light source for generating the light beam, and a motion device that varies the light beam direction as a function of a control signal. The light beam can be moved in the X and Y directions over the indicating surface in this way. The brightness of the light beam is varied by driving the light source appropriately; for example, via pulse-width modulation. The inertia of the human eye gives rise to the impression of a planar image when the light beam is moved, and the brightness varies, at sufficient speed.

The motion device can be configured in this case such that the light source itself is moved, and thus the light beam direction is varied. However, there is preferably a deflecting device which deflects the light beam as a function of the control signal.

This deflecting device preferably has a mirror, it being possible for the deflecting device in the X direction and the deflecting device in the Y direction to be constructed separately. That is to say, the beam is, for example, deflected first at a mirror system in the X direction and reflected onto a mirror that ensures a deflection in the Y direction. It is also possible, however, for there to be a mirror that can be tilted in two directions.

There are various possibilities for achieving the speeds of light beam deflection that are required to generate an image.

In a particularly preferred exemplary embodiment, one of the deflecting devices has a number of mirrors that are arranged one behind another on the circumference of a solid of revolution mounted in a fashion capable of rotation about its axis of symmetry. This is suggested, for example, in order to move the light beam very quickly in one direction in a linewise fashion over the indicating surface and to jump back to the starting point again at the end of the indicating surface for the respective line. Such a deflecting device with a quickly rotating solid of revolution can be used for the purpose of saving space at the same time as a vibration device; for example, by quickly changing the direction of rotation of the solid of revolution.

A further preferred embodiment is a deflecting device having a chip with an integrated deflecting element. This can be a type of movable mirror on a semiconductor chip.

Furthermore, the image projecting device preferably has optical elements (for example, lenses, concave mirrors, etc.) for forming the light beam and/or the beam region which can be detected by the beam. Such an optical element is preferably seated just upstream of the output of the light beam from the housing of the apparatus, in order to widen the beam region such that a satisfactorily large region on the indicating surface is detected.

The light source is preferably a semiconductor laser, since this is relatively small and generates a light beam of small divergence. In principle, however, it also can be a light source with a light emitting diode or similar.

It is also possible for the apparatus to have a number of light sources that generate light beams of different colors, for example. When use is made of light sources having the three primary colors of red, green and blue, any desired color can be generated by appropriate mixing, and so even color images can be displayed with good quality in this way.

Very many components of the image projector can be produced, or consist of, non-conducting material; for example, lenses made from plastic or glass. In addition, the light beam must cover a certain distance inside the apparatus in order to achieve in the deflecting directions, even with small angles of deflection, a

sufficiently large deflecting distance on the indicating surface. Consequently, for reasons of saving space, it is suggested to use for the image projector spatial regions in which no optically conductive parts, or only optically conductive parts that are small by comparison with the volume of the relevant regions, may be located, as in the case, for example, with the antenna volume of a mobile radio telephone. Consequently, the light beam is guided through the antenna regions in the case of apparatuses that have an antenna, at least parts of the image projector continuing to be located inside the antenna region of the apparatus.

In the case of the first exemplary embodiment, the apparatus has an integrated antenna with two metal surfaces. At least parts of the image projector are arranged here between the two metal surfaces. These parts can be, for example, a diverging lens or a relatively small mirror whose aluminized surface as conducting part is very small as against the overall volume of the antenna. Furthermore, the light source itself also can be arranged in the antenna volume, since the largest part of such a light source can be fabricated, with the exception of the semiconductor laserchip, from nonconducting material.

In an alternative preferred exemplary embodiment, the apparatus has a hollow rod antenna. In this case, some parts of the image projector, for example a diverging lens and a convex mirror, are arranged in the interior of the rod antenna.

The apparatus further has a stand with the aid of which the apparatus can be set up on a surface such that an exit point of the light beam from the housing or from the antenna of the apparatus is arranged in the prescribed position above the surface. Such a stand ensures that the apparatus stands at rest on the table in order to generate a clear image.

It is, furthermore, advantageous when the apparatus also has a second indicating device in the form of a conventional display integrated in the apparatus. This display can be used alternatively when no more use is made of the table surface at rest; for example, when the apparatus is used when underway, when driving a car, when walking or the like.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic lateral longitudinal section through a mobile telephone with an image projector according to the present invention, in accordance with a first exemplary embodiment.

Figure 2 shows a schematic section from above through a mobile telephone in accordance with Figure 1.

Figure 3 shows a schematic lateral longitudinal section through a mobile telephone with an integrated antenna with an image projector according to the present invention, in accordance with a second exemplary embodiment.

Figure 4 shows a schematic section from above through a mobile telephone as in Figure 3, but with a light source situated outside the antenna region.

Figure 5 shows an enlarged illustration of the antenna region of the apparatus from Figure 3.

Figure 6 shows a schematic illustration of the generation of an image on the indicating surface.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is illustrated in Figures 1-6 with the aid, in each case, of a mobile telephone 1; the apparatus in accordance with Figures 1 and 2 being a mobile telephone 1 with a rod antenna 17, and the apparatuses in accordance with Figures 3 and 4 being mobile telephones 1 with an integrated antenna 18 with two metal surfaces 19, 20.

Only the relevant parts of the antenna 17, 18 and of the image projecting device, as well as the housing 10 of the mobile telephones 1 are illustrated in each case here. Of course, these telephones 1 have all the usual features of a mobile telephone such as keypad, display, interfaces and the usual electronic components located in the mobile telephone.

In the case of all the apparatuses 1 illustrated in the exemplary embodiments, the image is generated, in each case, on the indicating surface 2, such as on a flat table surface 24, using the principle explained in Figure 6. In this case, a light beam is moved, with its brightness being varied, very quickly in the X and Y directions over the indicating surface 2. The X direction corresponds in this case to a movement inside an image row, and the Y direction to a movement inside

a column. Given sufficient speed, the impression of a planar image arises due to the inertia of the human eye.

As shown by the graph illustrated next to the beam S in Figure 6, the effective brightness of the light beam S is controlled by pulse width modulation. That is to say, as a function of time t either a light beam S with full intensity I is generated, or the light beam S is blocked out completely.

The light beam S should have as small a divergence as possible in this case. In the exemplary embodiment illustrated, the light beam S is, therefore, generated via a light source 3 with a semiconductor laser.

In the first exemplary embodiment in accordance with Figures 1 and 2, the light source 3 is located in the lower part, opposite the antenna 17, of the housing 10 of the mobile telephone 1.

Starting from this light source 3, the light beam S is directed onto a deflecting device 4 that reflects the beam S very quickly in the X-direction, that is to say within a line, and jumps back again at the end of the line to the start of a line. For this purpose, the X reflecting device 4 is constructed in the form of an octagonal solid of revolution 7 whose eight lateral surfaces are provided with mirrors 8. With one revolution of the solid of revolution 7 about the axis of rotation, the respective mirror 8 is tilted, resulting in a deflection of the beam in the X direction. Once the end of the respective mirror 8 is reached, the light beam automatically strikes the following mirror 8, as a result of which the beam jumps again immediately to the start of a line.

By a further mirror 14, the light beam S is then guided onto a Y deflecting device 5 with a tilting mirror. This Y deflecting device 5 is synchronized with the X deflecting device 4 such that when there is a change from one mirror 8 to a following mirror the Y deflecting device 5 is always adjusted such that the light beam S is displaced downward by one line on the indicating surface 2. When the last line is reached, the mirror of the Y deflecting device 5 is tilted back again automatically into the initial position.

Starting from the Y deflecting device 5, the light beam S is guided into a hollow rod antenna 17 in which there is located a plastic diverging lens 12 that expands the beam region. The beam S then falls at the end of the antenna 17 onto a convex mirror 13 that expands the beam region once more to the final size

required for the indicating surface 2. The convex mirror 13 then reflects the light beam S through an exit opening (not illustrated in the figures) from the underside of the antenna 17 onto the table surface 24. The exit opening is provided with a window.

In order to save space, the X deflecting device 4 is also simultaneously used with the solid of revolution 7 as vibration alarm unit by virtue of the fact that the solid of revolution 7 is set in rotation, the direction of rotation being changed periodically very quickly.

Located on the underside of the housing 10 of the mobile telephone 1 is a stand 33 that can be folded out and with which the telephone 1 is positioned on the table surface 24. As such, the exit opening in the antenna 17 is arranged at a prescribed position above the table surface 24 in which a sufficiently sharp image of the described size is generated on the table surface 24.

In the case of the second exemplary embodiment in accordance with Figure 3, the mobile telephone 1 has an integrated antenna 18 with two metal surfaces 19, 20 arranged one above the other. Here, as well, a light source 3 with a semiconductor laser is used again in order to generate the light beam S. The light source 3 is located here partly in the antenna volume; that is, between the metal surfaces 19, 20. This is possible since a majority of the light source 3 consists of non-conducting material. Only the semiconductor laser itself has metal parts. However, these are so small that they have no disturbing effect in the antenna volume.

The exemplary embodiment in accordance with Figure 4 is a telephone 1 that is identical to the exemplary embodiment in accordance with Figure 3. However, the light source 3 is accommodated in the lower part of the housing 10 outside the antenna volume.

The beam path with the individual components of the deflecting device in accordance with Figures 3 and 4 is illustrated in a magnified fashion in Figure 5. The light beam S falls here initially onto a mirror 15. This mirror 15 is also located in the antenna volume. It is fixed here via a holder 16. The holder 16 and the largest part of the mirror 15 are made from nonconducting material. Only the reflecting surface of the mirror 15 consists of a metal. However, this is likewise a

component which is so small that it has no kind of interfering effect at all in the overall antenna volume.

Starting from the mirror 15, the light beam is guided through an opening 21 in the upper metal surface 19 of the antenna 18 onto a deflecting device 6 located outside the antenna volume. This deflecting device 6 is a semiconductor chip 9 with a reflecting surface 11. The semiconductor chip 9 is located on a printed circuit board, which is not illustrated but is usually located in any case at this position in mobile telephones, on which the remaining electronic components of the mobile telephone 1 are also located. The reflecting surface 11 of this chip 9 can be varied in two directions such that the deflecting device 6 can simultaneously deflect in the X and Y directions. However, it also can be deflected here only in one direction, the deflection in the second direction being performed, for example, by a movement of the light source 3 itself.

The deflecting device 6 reflects the beam back through the opening 21 in the metal plate 19 onto a diverging lens 12, located inside the antenna volume, made from plastic or glass, which expands the beam region to the dimension required. Starting from the lens 12, the beam S then passes out of the antenna volume through an exit opening 22 located in the lower metal surface 20. Through an opening in the housing 10 of the mobile telephone 1 that is provided with a window and is not illustrated in Figures 3 and 4, the light beam S is then cast outward onto the table surface 24.

This telephone 1 in accordance with Figures 3 and 4 also has a stand 23 with the aid of which the telephone is appropriately positioned over the table surface 24.

In addition to the image projector according to the present invention, in the exemplary embodiments described the mobile telephones 1 have a conventional display (not illustrated in the figures). The information can be indicated as usual on this display.

In this case, an indication simultaneously can be produced by the image projector on a table surface and on the integrated display. However, it is also possible to choose to use only the integrated display or the image projector via appropriate keys and/or with the aid of appropriate functions that can be activated and deactivated via a menu control. Of course, it is also possible for different

images to be illustrated on the integrated display and by the image projector. Thus, for example, the menu for controlling the apparatus could be illustrated on the integrated display and, at the same time, the image transmitted by the interlocutor could be illustrated by the image projector in the case of a video phone.

Many components that are used to control the conventional display also can be used, in principle, for controlling the image projector. All that is necessary is to have available an appropriate interface that diverts the control signals sent from the driver to the display into the control signals for the deflecting device and for the light source.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

A small-scale communication and/or data processing apparatus with an indicating device, integrated in the apparatus, which has an image projector.

In the claims:

On page 13, cancel line 1, and substitute the following left-hand justified heading therefor:

CLAIMS

Please cancel 1-19, without prejudice, and substitute the following claims therefor:

20. A small-scale apparatus for at least one of communication and data processing, comprising:

an indicating device integrated in the apparatus, the indicating device having an image projector, and the image projector having both a light source for generating a light beam and a motion device for varying a direction of the light beam as a function of a control signal; and

an antenna, wherein the light beam traverses an antenna region inside the apparatus.

21. A small scale apparatus as claimed in claim 20, wherein the motion device includes a deflecting device for deflecting the light beam as a function of the control signal.

22. A small scale apparatus as claimed in claim 21, wherein the deflecting device includes a mirror.

23. A small scale apparatus as claimed in claim 21, wherein the deflecting device includes a plurality of mirrors arranged one behind another on a circumference of a solid of revolution mounted in a fashion capable of rotation about its axis of symmetry.

24. A small scale apparatus as claimed in claim 23, wherein the apparatus executes vibratory motions upon a fast periodic change in a direction of rotation of the solid of revolution.

25. A small scale apparatus as claimed in claim 21, wherein the deflecting device includes a chip with an integrated deflecting element.

26. A small scale apparatus as claimed in claim 20, further comprising an optical element for forming at least one of the light beam and a beam range.

27. A small scale apparatus as claimed in claim 20, wherein the light source includes a semiconductor laser.

28. A small scale apparatus as claimed in claim 20, wherein the light source includes a light-emitting diode.

29. A small scale apparatus as claimed in claim 20, wherein the image projector includes a plurality of light sources for generating light beams of different colors.

30. A small scale apparatus as claimed in claim 20, wherein at least parts of the image projector are arranged inside the antenna region of the apparatus.

31. A small scale apparatus as claimed in claim 30, wherein the antenna is an integrated antenna with two metal surfaces, and at least parts of the image projector are arranged between the metal surfaces.

32. A small scale apparatus as claimed in claim 31, wherein at least one of the metal surfaces includes a passage opening for the light beam.

33. A small scale apparatus as claimed in claim 30, wherein the antenna is a rod antenna, and at least parts of the image projector are arranged in an inner space of the rod antenna.

34. A small scale apparatus as claimed in claim 33, wherein the rod antenna includes a passage opening for the light beam.

35. A small scale apparatus as claimed in claim 30, wherein the parts of the image projector that are arranged in the antenna region are substantially nonconducting.

36. A small scale apparatus as claimed in claim 30, wherein conducting components, arranged in the antenna region, of the image projector have a small spatial extent in relation to an antenna volume.

37. A small scale apparatus as claimed in claim 20, further comprising a stand for setting up the apparatus on a surface such that at least one of an exit point for the light beam from a housing and the antenna of the apparatus is arranged at a prescribed position above the surface.

38. A small scale apparatus as claimed in claim 20, further comprising a second indicating device with a display integrated in the apparatus.

REMARKS

The present amendment makes editorial changes and corrects typographical errors in the specification, which includes the Abstract, in order to conform the specification to the requirements of United States Patent Practice. No new matter is added thereby. Attached hereto is a marked-up version of the changes made to the specification by the present amendment. The attached page is captioned "**Version With Markings To Show Changes Made**".

In addition, the present amendment cancels original claims 1-19 in favor of new claims 20-38. Claims 20-38 have been presented solely because the revisions by red-lining and underlining which would have been necessary in claims 1-19 in order to present those claims in accordance with preferred United States Patent Practice would have been too extensive, and thus would have been too burdensome. The present amendment is intended for clarification purposes only and not for substantial reasons related to patentability pursuant to 35 U.S.C. §§101, 102, 103 or 112. Indeed, the cancellation of claims 1-19 does not constitute an intent on the part of the Applicants to surrender any of the subject matter of claims 1-19.

Early consideration on the merits is respectfully requested.

Respectfully submitted,

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Attorneys for Applicants

VERSIONS WITH MARKINGS TO SHOW CHANGES MADE

In The Specification:

The Specification of the present application, including the Abstract, has been amended as follows:

~~Description~~

SPECIFICATION

TITLE OF THE INVENTION

SMALL-SCALE COMMUNICATION AND/OR

DATA PROCESSING APPARATUS

BACKGROUND OF THE INVENTION

The present invention relates to a small-scale communication and/or data processing apparatus with an indicating device integrated in the apparatus.

The term small-scale communication and/or data processing apparatus is understood below as mobile telephones, cordless telephones, PDAs, organizers, palmtops or the like whose size is such that they can be held in one hand when being operated. However, this ~~can~~ also can encompass relatively small apparatuses which are not taken along as mobile apparatuses, but are permanently installed~~,~~; for example, relatively small table telephones.

Such small-scale apparatuses frequently have an indicating device in the form of an integrated display on which the information to be indicated by the apparatus is represented. Moreover, this display usually serves to control the apparatus. There are two conflicting requirements for all these small-scale electronic apparatuses that communicate with a user via a display. On the one hand, the apparatus itself is to be as small as possible, while on the other hand the indicating element, that is to say the display, is to be as large as possible. However, there is a mandatory limit in the case of the displays previously used, in that the indicating surface cannot be larger than the surface of the apparatus.

In order to circumvent this problem, many apparatuses use interfaces with the aid of which the apparatus can be connected to a stationary indicating apparatus~~,~~; for example, a display screen. This has the disadvantage, on the one hand, that the advantage of mobility is lost when such a display screen is used, while on the other hand the appropriate display screen is not available at every site. In the case of stationary small-scale apparatuses, an external display screen

increases the overall space requirement of the apparatus, including the indicating system~~, and so~~. Thus, instead of a small-scale apparatus, use could be made here ~~equally~~ of a larger apparatus with a correspondingly large display.

It is an object of the present invention, therefore, to create an alternative to this prior art.

SUMMARY OF THE INVENTION

This object is achieved by ~~virtue of the fact~~ the present invention in that the indicating device integrated in the apparatus has an image projector.

In the case of such an active indicating system, integrated in the apparatus, in the form of an image projector, use ~~is~~ simply is made of a flat reflecting region as indicating surface~~;~~, for example, a piece of paper or a table. The advantage lies in the fact that such a passive indicating surface can be made available virtually anywhere. The indicating surface can be substantially larger in this case than the surface of the apparatus~~, that is to say~~. That is, the apparatus can have an indicating surface the size of a laptop, for example, whereas the apparatus itself is substantially smaller than a laptop. No sort of stationary external indicator, such as an external display screen or similar, is used in this case. Thus, there ~~is~~ also is no need to supply energy for a relatively large display screen. The indicating surface can be constructed again and again ~~using simple means~~ in simplified fashion and need not be carried around.

The image projector preferably has a light source for generating the light beam, and a motion device that varies the light beam direction as a function of a control signal. The light beam can be moved in the X -and Y -directions over the indicating surface in this way. The brightness of the light beam is varied by driving the light source appropriately~~;~~, for example, via pulse-width modulation. The inertia of the human eye gives rise to the impression of a planar image when the light beam is moved, and the brightness varies, at sufficient speed.

The motion device can be configured in this case such that the light source itself is moved, and thus the light beam direction is varied. However, there is preferably a deflecting device which deflects the light beam as a function of the control signal.

This deflecting device preferably has a mirror, it being possible for the deflecting device in the X -direction and the deflecting device in the Y -direction to

be constructed separately. That is to say, the beam is, for example, deflected first at a mirror system in the X -direction and reflected onto a mirror that ensures a deflection in the Y -direction. It is also possible, however, ~~in principle~~ for there to be a mirror that can be tilted in two directions.

There are various possibilities for achieving the speeds of light beam deflection that are required to generate an image.

In a particularly preferred exemplary embodiment, one of the deflecting devices has a ~~plurality~~ number of mirrors that are arranged one behind another on the circumference of a solid of revolution mounted in a fashion capable of rotation about its axis of symmetry. This is suggested, for example, in order to move the light beam very quickly in one direction in a linewise fashion over the indicating surface and to jump back to the starting point again at the end of the indicating surface for the respective line. Such a deflecting device with a quickly rotating solid of revolution can be used for the purpose of saving space at the same time as a vibration device~~,~~; for example, by quickly changing the direction of rotation of the solid of revolution.

A further preferred ~~alternative~~ embodiment is a deflecting device having a chip with an integrated deflecting element. This can be a type of movable mirror on a semiconductor chip.

Furthermore, the image projecting device preferably has optical elements~~,~~ (for example, lenses, concave ~~the~~ mirrors ~~etc.~~, etc.) for forming the light beam and/or the beam region which can be detected by the beam. Such an optical element is preferably seated just upstream of the output of the light beam from the housing of the apparatus, in order to widen the beam region such that a satisfactorily large region on the indicating surface is detected.

The light source is preferably a semiconductor laser, since this is relatively small and generates a light beam of small divergence. In principle, however, it ~~can~~ also can be a light source with a light emitting diode or similar.

It is also possible for the apparatus to have a ~~plurality~~ number of light sources that generate light beams of different colors, for example. When use is made of light sources having the three primary colors of red, green and blue, any desired color can be generated by appropriate mixing, and so even color images can be displayed with good quality in this way.

Very many components of the image projector can be produced, or consist of, non-conducting material~~,~~; for example, lenses made from plastic or glass~~, in any case nonconducting material~~. In addition, the light beam must cover a certain distance inside the apparatus in order to achieve in the deflecting directions, even with small angles of deflection, a sufficiently large deflecting distance on the indicating surface. Consequently, for reasons of saving space, it is suggested to use for the image projector spatial regions in which no optically conductive parts, or only optically conductive parts that are small by comparison with the volume of the relevant regions, may be located, as in the case, for example, with the antenna volume of a mobile radio telephone. Consequently, the light beam is guided through the antenna regions in the case of apparatuses that have an antenna, at least parts of the image projector continuing to be located inside the antenna region of the apparatus.

In the case of the first exemplary embodiment, the apparatus has an integrated antenna with two metal surfaces. At least parts of the image projector are arranged here between the two metal surfaces. These parts can be, for example, a diverging lens or a relatively small mirror whose aluminized surface as conducting part is very small as against the overall volume of the antenna. Furthermore, the light source itself ~~can~~ also can be arranged in the antenna volume, since the largest part of such a light source can be fabricated, with the exception of the semiconductor laserchip, from nonconducting material.

In an alternative preferred exemplary embodiment, the apparatus has a hollow rod antenna. In this case, some parts of the image projector, for example a diverging lens and a convex mirror, are arranged in the interior of the rod antenna.

The apparatus ~~also advantageously~~ further has a stand with the aid of which the apparatus can be set up on a surface such that an exit point of the light beam from the housing or from the antenna of the apparatus is arranged in the prescribed position above the surface. Such a stand ensures that the apparatus stands at rest on the table in order to generate a clear image.

It is, furthermore, advantageous when~~, in addition,~~ the apparatus also has a second indicating device in the form of a conventional display integrated in the apparatus. This display can be used alternatively when no more use is made of the

table surface at rest~~,~~; for example, when the apparatus is used when underway, when driving a car, when walking or the like.

Additional features and advantages of the present invention are described in, and will be apparent from, the following Detailed Description of the Invention and the Figures.

~~The invention is explained in more detail below with reference to the attached drawings and with the aid of exemplary embodiments. The features illustrated can be essential to the invention not only in said combination, but also individually or in other combinations. In the drawing:~~

BRIEF DESCRIPTION OF THE FIGURES

Figure 1 shows a schematic lateral longitudinal section through a mobile telephone with an image projector according to the present invention, in accordance with a first exemplary embodiment~~,~~.

Figure 2 shows a schematic section from above through a mobile telephone in accordance with Figure 1~~,~~.

Figure 3 shows a schematic lateral longitudinal section through a mobile telephone with an integrated antenna with an image projector according to the present invention, in accordance with ~~the~~ a second exemplary embodiment~~,~~.

Figure 4 shows a schematic section from above through a mobile telephone as in Figure 3, but with a light source situated outside the antenna region~~,~~.

Figure 5 shows an enlarged illustration of the antenna region of the apparatus from Figure 3~~, and~~.

Figure 6 shows a schematic illustration of the generation of an image on the indicating surface.

DETAILED DESCRIPTION OF THE INVENTION

The present invention is illustrated in ~~the figures~~ Figures 1-6 with the aid, in each case, of a mobile telephone 1~~,~~; the apparatus in accordance with Figures 1 and 2 being a mobile telephone 1 with a rod antenna 17, and the apparatuses in accordance with Figures 3 and 4 being mobile telephones 1 with an integrated antenna 18 with two metal surfaces 19, 20.

Only the relevant parts of the antenna 17, 18 and of the image projecting device, as well as the housing 10 of the mobile telephones 1 are illustrated in each case here. Of course, these telephones 1 have all the usual features of a mobile

telephone such as keypad, display, interfaces and the usual electronic components located in the mobile telephone.

In the case of all the apparatuses 1 illustrated in the exemplary embodiments, the image is generated, in each case, on the indicating surface 2, ~~for example~~ such as on a flat table surface 24, using the principle explained in Figure 6. In this case, a light beam is moved, with its brightness being varied, very quickly in the X -and Y -directions over the indicating surface 2. The X -direction corresponds in this case to a movement inside an image row, and the Y -direction to a movement inside a column. Given sufficient speed, the impression of a planar image arises ~~owing~~ due to the inertia of the human eye.

As shown by the graph illustrated next to the beam S in Figure 6, the effective brightness of the light beam S is controlled by pulse width modulation. That is to say, as a function of time t either a light beam S with full intensity I is generated, or the light beam S is blocked out completely.

The light beam S should have as small a divergence as possible in this case. In the exemplary embodiment illustrated, the light beam S is, therefore, generated ~~by means of~~ via a light source 3 with a semiconductor laser.

In the first exemplary embodiment in accordance with Figures 1 and 2, the light source 3 is located in the lower part, opposite the antenna 17, of the housing 10 of the mobile telephone 1.

Starting from this light source 3, the light beam S is directed onto a deflecting device 4 that reflects the beam S very quickly in the X-direction, that is to say within a line, and jumps back again at the end of the line to the start of a line. For this purpose, the X reflecting device 4 is constructed in the form of an octagonal solid of revolution 7 whose eight lateral surfaces are provided with mirrors 8. With one revolution of the solid of revolution 7 about the axis of rotation, the respective mirror 8 is tilted, resulting in a deflection of the beam in the X -direction. Once the end of the respective mirror 8 is reached, the light beam automatically strikes the following mirror 8, as a result of which the beam jumps again immediately to the start of a line.

By a further mirror 14, the light beam S is then guided onto a Y deflecting device 5 with a tilting mirror. This Y deflecting device 5 is synchronized with the X deflecting device 4 such that when there is a change from one mirror 8 to a

following mirror the Y deflecting device 5 is always adjusted such that the light beam S is displaced downward by one line on the indicating surface 2. When the last line is reached, the mirror of the Y deflecting device 5 is tilted back again automatically into the initial position.

Starting from the Y deflecting device 5, the light beam S is guided into a hollow rod antenna 17 in which there is located a plastic diverging lens 12 that expands the beam region. The beam S then falls at the end of the antenna 17 onto a convex mirror 13 that expands the beam region once more to the final size required for the indicating surface 2. The convex mirror 13 then reflects the light beam S through an exit opening (not illustrated in the figures) from the underside of the antenna 17 onto the table surface 24. The exit opening is provided with a window.

In order to save space, the X deflecting device 4 is also simultaneously used with the solid of revolution 7 as vibration alarm unit by virtue of the fact that the solid of revolution 7 is set in rotation, the direction of rotation being changed periodically very quickly.

Located on the underside of the housing 10 of the mobile telephone 1 is a stand 33 that can be folded out and with which the telephone 1 is positioned on the table surface 24. As such ~~that~~, the exit opening in the antenna 17 is arranged at a prescribed position above the table surface 24 in which a sufficiently sharp image of the described size is generated on the table surface 24.

In the case of the second exemplary embodiment in accordance with Figure 3, the mobile telephone 1 has an integrated antenna 18 with two metal surfaces 19, 20 arranged one above the other. Here, as well, a light source 3 with a semiconductor laser is used again in order to generate the light beam S. The light source 3 is located here partly in the antenna volume~~,~~; that is ~~to say~~, between the metal surfaces 19, 20. This is possible~~,~~ since a majority of the light source 3 consists of non-conducting material. Only the semiconductor laser itself has metal parts. However, these are so small that they have no disturbing effect in the antenna volume.

The exemplary embodiment in accordance with Figure 4 is a telephone 1 that is identical to the exemplary embodiment in accordance with Figure 3~~,~~

~~although~~. However, the light source 3 is accommodated in the lower part of the housing 10 outside the antenna volume.

The beam path with the individual components of the deflecting device in accordance with Figures 3 and 4 is illustrated in a magnified fashion in Figure 5. The light beam S falls here initially onto a mirror 15. This mirror 15 is also located in the antenna volume. It is fixed here via a holder 16. The holder 16 and the largest part of the mirror 15 are made from nonconducting material. Only the reflecting surface of the mirror 15 consists of a metal. However, this is likewise a component which is so small that it has no kind of interfering effect at all in the overall antenna volume.

Starting from the mirror 15, the light beam is guided through an opening 21 in the upper metal surface 19 of the antenna 18 onto a deflecting device 6 located outside the antenna volume. This deflecting device 6 is a semiconductor chip 9 with a reflecting surface 11. The semiconductor chip 9 is located on a printed circuit board, which is not illustrated but is usually located in any case at this position in mobile telephones, on which the remaining electronic components of the mobile telephone 1 are also located. The reflecting surface 11 of this chip 9 can be varied in two directions such that the deflecting device 6 can simultaneously deflect in the X -and Y -directions. However, it ~~can~~ also can be deflected here only in one direction, the deflection in the second direction being performed, for example, by a movement of the light source 3 itself.

The deflecting device 6 reflects the beam back through the opening 21 in the metal plate 19 onto a diverging lens 12, located inside the antenna volume, made from plastic or glass, which expands the beam region to the dimension required. Starting from the lens 12, the beam S then passes out of the antenna volume through an exit opening 22 located in the lower metal surface 20. Through an opening in the housing 10 of the mobile telephone 1 that is provided with a window and is not illustrated in Figures 3 and 4, the light beam S is then cast outward onto the table surface 24.

This telephone 1 in accordance with Figures 3 and 4 also has a stand 23 with the aid of which the telephone is appropriately positioned over the table surface 24.

In addition to the image projector according to the present invention, in the exemplary embodiments described the mobile telephones 1 have a conventional display (not illustrated in the figures). The information can be indicated as usual on this display.

In this case, an indication ~~can~~ simultaneously can be produced by the image projector on a table surface and on the integrated display. However, it is also possible to choose to use only the integrated display or the image projector ~~by means of~~ via appropriate keys and/or with the aid of appropriate functions that can be activated and deactivated via a menu control. Of course, it is also possible for different images to be illustrated on the integrated display and by the image projector. Thus, for example, the menu for controlling the apparatus could be illustrated on the integrated display and, at the same time, the image transmitted by the interlocutor could be illustrated by the image projector in the case of a video phone.

Many components that are used to control the conventional display ~~can~~ also can be used, in principle, for controlling the image projector. All that is necessary is to have available an appropriate interface that diverts the control signals sent from the driver to the display into the control signals for the deflecting device and for the light source.

Although the present invention has been described with reference to specific embodiments, those of skill in the art will recognize that changes may be made thereto without departing from the spirit and scope of the invention as set forth in the hereafter appended claims.

ABSTRACT OF THE DISCLOSURE

A small-scale communication and/or data processing apparatus ~~(1)~~ with an indicating device, integrated in the apparatus, ~~characterized in that the indicating device has an image projector.~~

3/prts

Description

Small-scale communication and/or data processing apparatus

The invention relates to a small-scale communication and/or data processing apparatus with an indicating device integrated in the apparatus.

The term small-scale communication and/or data processing apparatus is understood below as mobile telephones, cordless telephones, PDAs, organizers, palmtops or the like whose size is such that they can be held in one hand when being operated. However, this can also encompass relatively small apparatuses which are not taken along as mobile apparatuses, but are permanently installed, for example relatively small table telephones.

Such small-scale apparatuses frequently have an indicating device in the form of an integrated display on which the information to be indicated by the apparatus is represented. Moreover, this display usually serves to control the apparatus. There are two conflicting requirements for all these small-scale electronic apparatuses that communicate with a user via a display. On the one hand, the apparatus itself is to be as small as possible, while on the other hand the indicating element, that is to say the display, is to be as large as possible. However, there is a mandatory limit in the case of the displays previously used, in that the indicating surface cannot be larger than the surface of the apparatus.

In order to circumvent this problem, many apparatuses use interfaces with the aid of which the apparatus can be connected to a stationary indicating apparatus, for example a display screen. This has the disadvantage, on the one hand, that the advantage of mobility is lost

when such a display screen is used, while on the other hand the appropriate display screen is not available at every site. In the case of stationary small-scale apparatuses, an external display screen increases the overall space requirement of the apparatus including indicating system, and so instead of a small-scale apparatus use could be made here equally of a larger apparatus with a correspondingly large display.

It is an object of the present invention to create an alternative to this prior art.

This object is achieved by virtue of the fact that the indicating device integrated in the apparatus has an image projector.

In the case of such an active indicating system, integrated in the apparatus, in the form of an image projector, use is simply made of a flat reflecting region as indicating surface, for example a piece of paper or a table. The advantage lies in the fact that such a passive indicating surface can be made available virtually anywhere. The indicating surface can be substantially larger in this case than the surface of the apparatus, that is to say the apparatus can have an indicating surface the size of a laptop, for example, whereas the apparatus itself is substantially smaller than a laptop. No sort of stationary external indicator, such as an external display screen or similar, is used in this case. Thus, there is also no need to supply energy for a relatively large display screen. The indicating surface can be constructed again and again using simple means and need not be carried around.

The image projector preferably has a light source for generating the light beam, and a motion device that varies the light beam direction as a function of a control signal. The light beam can be moved in the X-

and Y-directions over the indicating surface in this way. The brightness of the light beam is varied by driving the light source appropriately, for example via pulse-width modulation. The inertia of the human eye gives rise to the impression of a planar image when the light beam is moved, and the brightness varies, at sufficient speed.

The motion device can be configured in this case such that the light source itself is moved, and thus the light beam direction is varied. However, there is preferably a deflecting device which deflects the light beam as a function of the control signal.

This deflecting device preferably has a mirror, it being possible for the deflecting device in the X-direction and the deflecting device in the Y-direction to be constructed separately. That is to say, the beam is, for example, deflected first at a mirror system in the X-direction and reflected onto a mirror that ensures a deflection in the Y-direction. It is also possible, however, in principle for there to be a mirror that can be tilted in two directions.

There are various possibilities for achieving the speeds of light beam deflection that are required to generate an image.

In a particularly preferred exemplary embodiment, one of the deflecting devices has a plurality of mirrors that are arranged one behind another on the circumference of a solid of revolution mounted in a fashion capable of rotation about its axis of symmetry. This is suggested, for example, in order to move the light beam very quickly in one direction in a linewise fashion over the indicating surface and to jump back to the starting point again at the end of the indicating surface for the respective line. Such a deflecting device with a quickly rotating solid of revolution can

be used for the purpose of saving space at the same time as a vibration device, for example by quickly changing the direction of rotation of the solid of revolution.

A further preferred alternative is a deflecting device having a chip with an integrated deflecting element. This can be a type of movable mirror on a semiconductor chip.

Furthermore, the image projecting device preferably has optical elements, for example lenses, concave the mirrors etc. for forming the light beam and/or the beam region which can be detected by the beam. Such an optical element is preferably seated just upstream of the output of the light beam from the housing of the apparatus, in order to widen the beam region such that a satisfactorily large region on the indicating surface is detected.

The light source is preferably a semiconductor laser, since this is relatively small and generates a light beam of small divergence. In principle, however, it can also be a light source with a light emitting diode or similar.

It is also possible for the apparatus to have a plurality of light sources that generate light beams of different colors, for example. When use is made of light sources having the three primary colors of red, green and blue, any desired color can be generated by appropriate mixing, and so even color images can be displayed with good quality in this way.

Very many components of the image projector can be produced, or consist of, non-conducting material, for example lenses made from plastic or glass, in any case nonconducting material. In addition, the light beam must cover a certain distance inside the apparatus in

order to achieve in the deflecting directions, even with small angles of deflection, a sufficiently large deflecting distance on the indicating surface. Consequently, for reasons of saving space it is suggested to use for the image projector spatial regions in which no optically conductive parts, or only optically conductive parts that are small by comparison with the volume of the relevant regions, may be located, as in the case, for example, with the antenna volume of a mobile radio telephone. Consequently, the light beam is guided through the antenna regions in the case of apparatuses that have an antenna, at least parts of the image projector continuing to be located inside the antenna region of the apparatus.

In the case of the first exemplary embodiment, the apparatus has an integrated antenna with two metal surfaces. At least parts of the image projector are arranged here between the two metal surfaces. These parts can be, for example, a diverging lens or a relatively small mirror whose aluminized surface as conducting part is very small as against the overall volume of the antenna. Furthermore, the light source itself can also be arranged in the antenna volume, since the largest part of such a light source can be fabricated, with the exception of the semiconductor laserchip, from nonconducting material.

In an alternative preferred exemplary embodiment, the apparatus has a hollow rod antenna. In this case, some parts of the image projector, for example a diverging lens and a convex mirror, are arranged in the interior of the rod antenna.

The apparatus also advantageously further has a stand with the aid of which the apparatus can be set up on a surface such that an exit point of the light beam from the housing or from the antenna of the apparatus is arranged in the prescribed position above the surface.

Such a stand ensures that the apparatus stands at rest on the table in order to generate a clear image.

It is, furthermore, advantageous when, in addition, the apparatus also has a second indicating device in the form of a conventional display integrated in the apparatus. This display can be used alternatively when no more use is made of the table surface at rest, for example when the apparatus is used when underway, when driving a car, when walking or the like.

The invention is explained in more detail below with reference to the attached drawings and with the aid of exemplary embodiments. The features illustrated can be essential to the invention not only in said combination, but also individually or in other combinations. In the drawing:

Figure 1 shows a schematic lateral longitudinal section through a mobile telephone with an image projector according to the invention, in accordance with a first exemplary embodiment,

Figure 2 shows a schematic section from above through a mobile telephone in accordance with Figure 1,

Figure 3 shows a schematic lateral longitudinal section through a mobile telephone with an integrated antenna with an image projector according to the invention, in accordance with the second exemplary embodiment,

Figure 4 shows a schematic section from above through a mobile telephone as in Figure 3, but with a light source situated outside the antenna region,

Figure 5 shows an enlarged illustration of the antenna region of the apparatus from Figure 3, and

Figure 6 shows a schematic illustration of the generation of an image on the indicating surface.

The invention is illustrated in the figures with the aid in each case of a mobile telephone 1, the apparatus in accordance with Figures 1 and 2 being a mobile telephone 1 with a rod antenna 17, and the apparatuses in accordance with Figures 3 and 4 being mobile telephones 1 with an integrated antenna 18 with two metal surfaces 19, 20.

Only the relevant parts of the antenna 17, 18 and of the image projecting device, as well as the housing 10 of the mobile telephones 1 are illustrated in each case here. Of course, these telephones 1 have all the usual features of a mobile telephone such as keypad, display, interfaces and the usual electronic components located in the mobile telephone.

In the case of all the apparatuses 1 illustrated in the exemplary embodiments, the image is generated in each case on the indicating surface 2, for example on a flat table surface 24, using the principle explained in Figure 6. In this case, a light beam is moved, with its brightness being varied, very quickly in the X- and Y-directions over the indicating surface 2. The X-direction corresponds in this case to a movement inside an image row, and the Y-direction to a movement inside a column. Given sufficient speed, the impression of a planar image arises owing to the inertia of the human eye.

As shown by the graph illustrated next to the beam S in Figure 6, the effective brightness of the light beam S is controlled by pulse width modulation. That is to say, as a function of time t either a light beam S with full intensity I is generated, or the light beam S is blocked out completely.

The light beam S should have as small a divergence as possible in this case. In the exemplary embodiment illustrated, the light beam S is therefore generated by means of a light source 3 with a semiconductor laser.

In the first exemplary embodiment in accordance with Figures 1 and 2, the light source 3 is located in the lower part, opposite the antenna 17, of the housing 10 of the mobile telephone 1.

Starting from this light source 3, the light beam S is directed onto a deflecting device 4 that reflects the beam S very quickly in the X-direction, that is to say within a line, and jumps back again at the end of the line to the start of a line. For this purpose, the X reflecting device 4 is constructed in the form of an octagonal solid of revolution 7 whose eight lateral surfaces are provided with mirrors 8. With one revolution of the solid of revolution 7 about the axis of rotation, the respective mirror 8 is tilted, resulting in a deflection of the beam in the X-direction. Once the end of the respective mirror 8 is reached, the light beam automatically strikes the following mirror 8, as a result of which the beam jumps again immediately to the start of a line.

By a further mirror 14, the light beam S is then guided onto a Y deflecting device 5 with a tilting mirror. This Y deflecting device 5 is synchronized with the X deflecting device 4 such that when there is a change from one mirror 8 to a following mirror the Y deflecting device 5 is always adjusted such that the light beam S is displaced downward by one line on the indicating surface 2. When the last line is reached, the mirror of the Y deflecting device 5 is tilted back again automatically into the initial position.

Starting from the Y deflecting device 5, the light beam S is guided into a hollow rod antenna 17 in which there

is located a plastic diverging lens 12 that expands the beam region. The beam S then falls at the end of the antenna 17 onto a convex mirror 13 that expands the beam region once more to the final size required for the indicating surface 2. The convex mirror 13 then reflects the light beam S through an exit opening (not illustrated in the figures) from the underside of the antenna 17 onto the table surface 24. The exit opening is provided with a window.

In order to save space, the X deflecting device 4 is also simultaneously used with the solid of revolution 7 as vibration alarm unit by virtue of the fact that the solid of revolution 7 is set in rotation, the direction of rotation being changed periodically very quickly.

Located on the underside of the housing 10 of the mobile telephone 1 is a stand 33 that can be folded out and with which the telephone 1 is positioned on the table surface 24 such that the exit opening in the antenna 17 is arranged at a prescribed position above the table surface 24 in which a sufficiently sharp image of the described size is generated on the table surface 24.

In the case of the second exemplary embodiment in accordance with Figure 3, the mobile telephone 1 has an integrated antenna 18 with two metal surfaces 19, 20 arranged one above the other. Here, as well, a light source 3 with a semiconductor laser is used again in order to generate the light beam S. The light source 3 is located here partly in the antenna volume, that is to say between the metal surfaces 19, 20. This is possible, since a majority of the light source 3 consists of non-conducting material. Only the semiconductor laser itself has metal parts. However, these are so small that they have no disturbing effect in the antenna volume.

The exemplary embodiment in accordance with Figure 4 is a telephone 1 that is identical to the exemplary embodiment in accordance with Figure 3, although the light source 3 is accommodated in the lower part of the housing 10 outside the antenna volume.

The beam path with the individual components of the deflecting device in accordance with Figures 3 and 4 is illustrated in a magnified fashion in Figure 5. The light beam S falls here initially onto a mirror 15. This mirror 15 is also located in the antenna volume. It is fixed here via a holder 16. The holder 16 and the largest part of the mirror 15 are made from nonconducting material. Only the reflecting surface of the mirror 15 consists of a metal. However, this is likewise a component which is so small that it has no kind of interfering effect at all in the overall antenna volume.

Starting from the mirror 15, the light beam is guided through an opening 21 in the upper metal surface 19 of the antenna 18 onto a deflecting device 6 located outside the antenna volume. This deflecting device 6 is a semiconductor chip 9 with a reflecting surface 11. The semiconductor chip 9 is located on a printed circuit board, which is not illustrated but is usually located in any case at this position in mobile telephones, on which the remaining electronic components of the mobile telephone 1 are also located. The reflecting surface 11 of this chip 9 can be varied in two directions such that the deflecting device 6 can simultaneously deflect in the X- and Y-directions. However, it can also be deflected here only in one direction, the deflection in the second direction being performed, for example, by a movement of the light source 3 itself.

The deflecting device 6 reflects the beam back through the opening 21 in the metal plate 19 onto a diverging

lens 12, located inside the antenna volume, made from plastic or glass, which expands the beam region to the dimension required. Starting from the lens 12, the beam S then passes out of the antenna volume through an exit opening 22 located in the lower metal surface 20. Through an opening in the housing 10 of the mobile telephone 1 that is provided with a window and is not illustrated in Figures 3 and 4, the light beam S is then cast outward onto the table surface 24.

This telephone 1 in accordance with Figures 3 and 4 also has a stand 23 with the aid of which the telephone is appropriately positioned over the table surface 24.

In addition to the image projector according to the invention, in the exemplary embodiments described the mobile telephones 1 have a conventional display (not illustrated in the figures). The information can be indicated as usual on this display.

In this case, an indication can simultaneously be produced by the image projector on a table surface and on the integrated display. However, it is also possible to choose to use only the integrated display or the image projector by means of appropriate keys and/or with the aid of appropriate functions that can be activated and deactivated via a menu control. Of course, it is also possible for different images to be illustrated on the integrated display and by the image projector. Thus, for example, the menu for controlling the apparatus could be illustrated on the integrated display and, at the same time, the image transmitted by the interlocutor could be illustrated by the image projector in the case of a video phone.

Many components that are used to control the conventional display can also be used in principle for controlling the image projector. All that is necessary is to have available an appropriate interface that

diverts the control signals sent from the driver to the display into the control signals for the deflecting device and for the light source.

New Patent Claims

1. A small-scale communication and/or data processing apparatus (1) with an indicating device integrated in the apparatus, the indicating device having an image projector, and the image projector having a light source (3) for generating a light beam (S) and a motion device that varies the light beam direction as a function of a control signal, characterized in that the apparatus has an antenna (17, 18), and the light beam (S) traverses an antenna region inside the apparatus (1).

2. The apparatus as claimed in claim 1, characterized in that the motion device has a deflecting device (4, 5, 6, 14, 15, 16) that deflects the light beam (S) as a function of a control signal.

3. The apparatus as claimed in claim 2, characterized in that the deflecting device (4, 5, 6, 14, 15, 16) has a mirror (8, 14, 15).

4. The apparatus as claimed in one of the preceding claims, characterized in that the deflecting device (4) has a plurality of mirrors (8) arranged one behind another on the circumference of a solid of revolution (7) mounted in a fashion capable of rotation about its axis of symmetry.

5. The apparatus as claimed in claim 4, characterized in that the deflecting device (4) with the solid of revolution (7) is configured in such a way that the apparatus (1) executes vibratory motions in the event of a fast periodic change in the direction of rotation of the solid of revolution (7).

6. The apparatus as claimed in one of claims 2 to 5, characterized in that the deflecting device (6) has a chip (9) with an integrated deflecting element (11).

7. The apparatus as claimed in one of the preceding claims, characterized by an optical element (12, 13) for forming the light beam (S) and/or the beam range.

8. The apparatus as claimed in one of the preceding claims, characterized in that the light source (3) has a semiconductor laser.

9. The apparatus as claimed in one of the preceding claims, characterized in that the light source has a light-emitting diode.

10. The apparatus as claimed in one of the preceding claims, characterized by a plurality of light sources that generate light beams of different colors.

11. The apparatus as claimed in one of the preceding claims, characterized in that at least parts (3, 12, 13, 15, 16) of the image projector are arranged inside an antenna region of the apparatus (1).

12. The apparatus as claimed in claim 11, characterized in that the antenna is an integrated antenna (18) with two metal surfaces (19, 20), and at least parts (3, 12, 15, 16) of the image projector are arranged between the metal surfaces (19, 20).

13. The apparatus as claimed in claim 12, characterized in that at least one of the metal surfaces (19, 20) has a passage opening (21, 22) for the light beam (S).

14. The apparatus as claimed in claim [lacuna], characterized in that the antenna is a rod antenna (17), and at least parts (12, 13) of the image projector are arranged in an inner space of the rod antenna (17).

15. The apparatus as claimed in claim 14, characterized in that the rod antenna (17) has a passage opening for the light beam (S).

16. The apparatus as claimed in one of claims 11 to 15, characterized in that the parts (3, 12, 13, 15, 16) of the image projector that are arranged in the antenna region are substantially nonconducting.

17. The apparatus as claimed in one of claims 11 to 16, characterized in that conducting components, arranged in the antenna region, of the image projector have a small spatial extent in relation to the antenna volume.

18. The apparatus as claimed in one of the preceding claims, characterized by a stand (23) for setting up the apparatus (1) of a surface (24) such that an exit point for the light beam (S) from a housing (10) and/or an antenna (17) of the apparatus (1) is arranged at a prescribed position above the surface (24).

19. The apparatus as claimed in one of the preceding claims, characterized by a second indicating device with the display integrated in the apparatus (1).

GR 99 P 2679

Abstract

Small-scale communication and/or data processing apparatus

A description is given of a small-scale communication and/or data processing apparatus (1) with an indicating device integrated in the apparatus. This indicating device has an image projector.

FIG 1

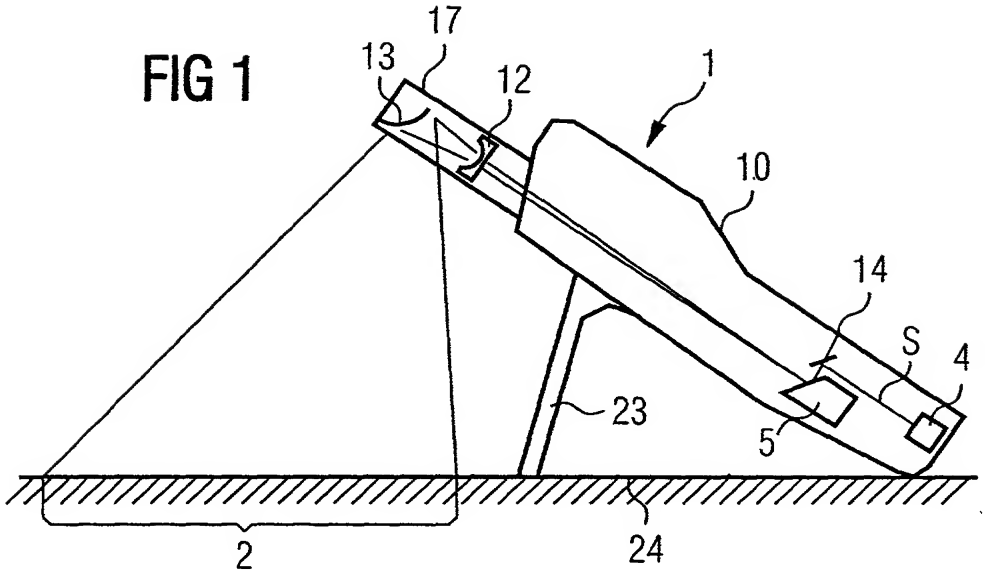


FIG 2

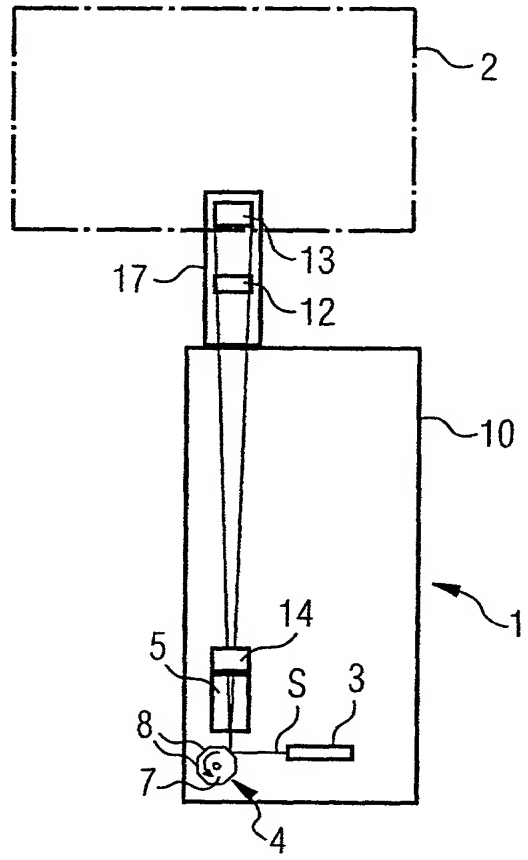


FIG 3

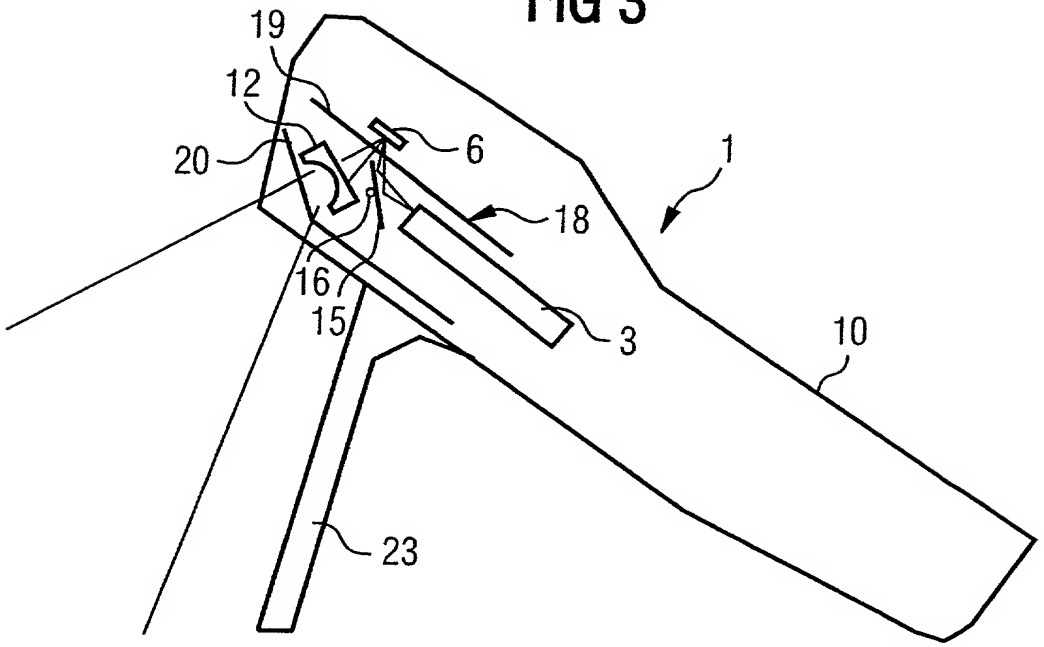


FIG 4

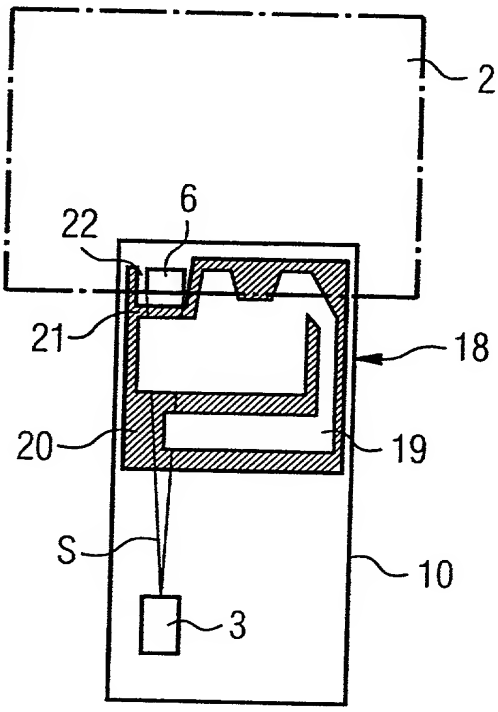


FIG 5

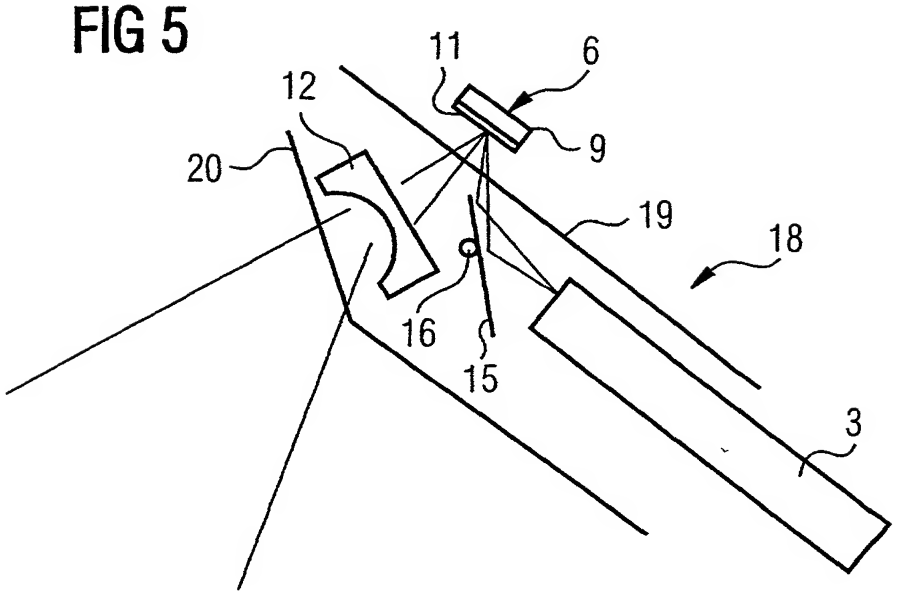
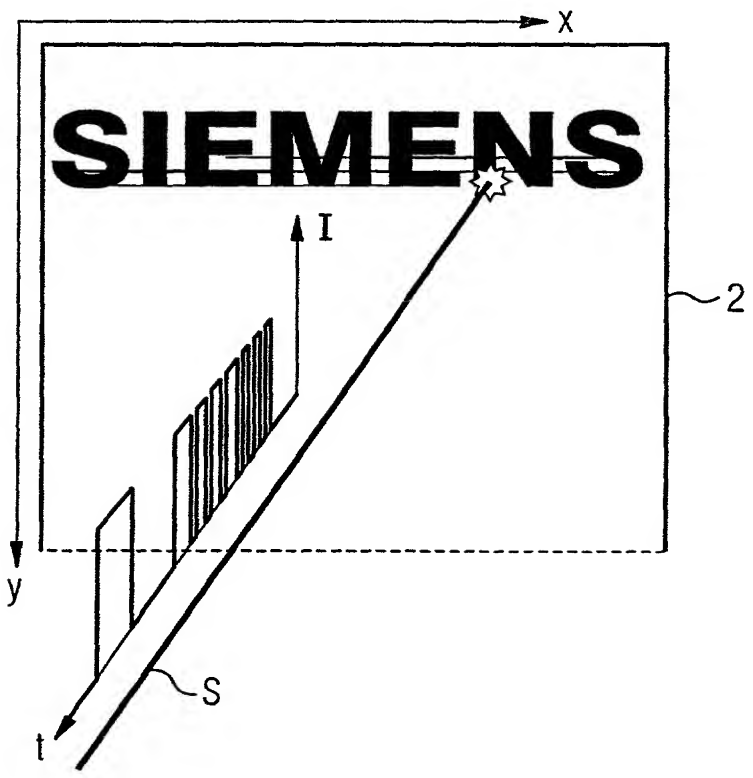


FIG 6



Declaration and Power of Attorney For Patent Application
Erklärung Für Patentanmeldungen Mit Vollmacht
German Language Declaration

Als nachstehend benannter Erfinder erkläre ich hiermit an Eides Statt:

As a below named inventor, I hereby declare that:

dass mein Wohnsitz, meine Postanschrift, und meine Staatsangehörigkeit den im Nachstehenden nach meinem Namen aufgeführten Angaben entsprechen,

My residence, post office address and citizenship are as stated below next to my name,

dass ich, nach bestem Wissen der ursprüngliche, erste und alleinige Erfinder (falls nachstehend nur ein Name angegeben ist) oder ein ursprünglicher, erster und Miterfinder (falls nachstehend mehrere Namen aufgeführt sind) des Gegenstandes bin, für den dieser Antrag gestellt wird und für den ein Patent beantragt wird für die Erfindung mit dem Titel:

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled

Kommunikations- und/oder Datenverarbeitungs-Kleingeraet

SMALL APPARATUS FOR PROCESSING COMMUNICATIONS AND/OR DATA, SAID APPARATUS COMPRISING A PROJECTOR

deren Beschreibung

(zutreffendes ankreuzen)
☐ hier beigefügt ist.
☒ am 23.August 2000 als
PCT internationale Anmeldung
PCT Anmeldungsnummer PCT/DE00/02871
eingereicht wurde und am _____
abgeändert wurde (falls tatsächlich abgeändert).

the specification of which

(check one)
☐ is attached hereto.
☒ was filed on _____ as
PCT international application
PCT Application No. _____
and was amended on _____
(if applicable)

Ich bestätige hiermit, dass ich den Inhalt der obigen Patentanmeldung einschliesslich der Ansprüche durchgesehen und verstanden habe, die eventuell durch einen Zusatzantrag wie oben erwähnt abgeändert wurde.

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims as amended by any amendment referred to above.

Ich erkenne meine Pflicht zur Offenbarung irgendwelcher Informationen, die für die Prüfung der vorliegenden Anmeldung in Einklang mit Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) von Wichtigkeit sind, an.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

Ich beanspruche hiermit ausländische Prioritätsvorteile gemäss Abschnitt 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 119 aller unten angegebenen Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde, und habe auch alle Auslandsanmeldungen für ein Patent oder eine Erfindersurkunde nachstehend gekennzeichnet, die ein Anmeldedatum haben, das vor dem Anmeldedatum der Anmeldung liegt, für die Priorität beansprucht wird.

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate listed below and have also identified below any foreign application for patent or inventor's certificate having a filing date before that of the application on which priority is claimed:

German Language Declaration

Prior foreign appplications
Priorität beansprucht

			Priority Claimed	
19940757.6	DE	27.08.1999	☒	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein
			☐	☐
(Number) (Nummer)	(Country) (Land)	(Day Month Year Filed) (Tag Monat Jahr eingereicht)	Yes Ja	No Nein

Ich beanspruche hiermit gemäss Absatz 35 der Zivilprozessordnung der Vereinigten Staaten, Paragraph 120, den Vorzug aller unten aufgeführten Anmeldungen und falls der Gegenstand aus jedem Anspruch dieser Anmeldung nicht in einer früheren amerikanischen Patentanmeldung laut dem ersten Paragraphen des Absatzes 35 der Zivilprozeßordnung der Vereinigten Staaten, Paragraph 122 offenbart ist, erkenne ich gemäss Absatz 37, Bundesgesetzbuch, Paragraph 1.56(a) meine Pflicht zur Offenbarung von Informationen an, die zwischen dem Anmeldedatum der früheren Anmeldung und dem nationalen oder PCT internationalen Anmeldedatum dieser Anmeldung bekannt geworden sind.

I hereby claim the benefit under Title 35. United States Code. §120 of any United States application(s) listed below and, insofar as the subject matter of each of the claims of this application is not disclosed in the prior United States application in the manner provided by the first paragraph of Title 35, United States Code, §122, I acknowledge the duty to disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occured between the filing date of the prior application and the national or PCT international filing date of this application.

(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D, M, Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgegeben)	(Status) (patented, pending, abandoned)
(Application Serial No.) (Anmeldeseriennummer)	(Filing Date D,M,Y) (Anmeldedatum T, M, J)	(Status) (patentiert, anhängig, aufgeben)	(Status) (patented, pending, abandoned)

Ich erkläre hiermit, dass alle von mir in der vorliegenden Erklärung gemachten Angaben nach meinem besten Wissen und Gewissen der vollen Wahrheit entsprechen, und dass ich diese eidesstattliche Erklärung in Kenntnis dessen abgebe, dass wissentlich und vorsätzlich falsche Angaben gemäss Paragraph 1001, Absatz 18 der Zivilprozessordnung der Vereinigten Staaten von Amerika mit Geldstrafe belegt und/oder Gefängnis bestraft werden koennen, und dass derartig wissentlich und vorsätzlich falsche Angaben die Gültigkeit der vorliegenden Patentanmeldung oder eines darauf erteilten Patentes gefährden können.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

German Language Declaration

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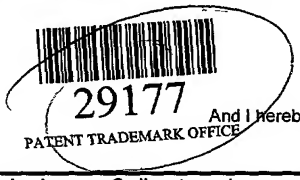
POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(list name and registration number)*



Customer No. And I hereby appoint

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Ext. _____

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Three First National Plaza, 70 West Madison Street, Suite 3300 60602-4207 Chicago, Illinois
Telephone: (001) 312 372 11 21 and Facsimile (001) 312 827 8185
or
Customer No.

Voller Name des einzigen oder ursprünglichen Erfinders:	Full name of sole or first inventor:
Dr. PETER NEVERMANN	Dr. PETER NEVERMANN
Unterschrift des Erfinders Datum	Inventor's signature Date
P. Pehn 12.02.02	
Wohnsitz	Residence
San Diego, CA, UNITED STATES OF AMERICA	San Diego, CA, UNITED STATES OF AMERICA
Staatsangehörigkeit	Citizenship
DE	DE
Postanschrift	Post Office Addess
8858 Ragweed Court	8858 Ragweed Court
92129 San Diego, CA CA UNITED STATES OF AMERICA	92129 San Diego, CA UNITED STATES OF AMERICA
Voller Name des zweiten Miterfinders (falls zutreffend):	Full name of second joint inventor, if any:
Unterschrift des Erfinders Datum	Second inventor's signature Date
Wohnsitz ,	Residence ,
Staatsangehörigkeit	Citizenship
Postanschrift	Post Office Address

(Bitte entsprechende Informationen und Unterschriften im Falle von dritten und weiteren Miterfindern angeben).

(Supply similar information and signature for third and subsequent joint inventors).